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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/579,748	05/18/2006	Shinji Miyauchi	L7002.06102	3566

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EXAMINER	
MERKLING, MATTHEW J	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/579,748	MIYAUCHI ET AL.	
	Examiner	Art Unit	
	MATTHEW J. MERKLING	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *3/18/08*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4-11,16-20 and 26-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *16-20* is/are allowed.

6)☒ Claim(s) *4-11 and 26-28* is/are rejected.

7)☒ Claim(s) *29* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/18/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 8 and 9 are objected to because of the following informalities: in the third line of claims 8 and 9, Applicant claims "introducing the air to the interior…". However, "the air" was not previously defined in the claims. For purposes of this examination, seeing that this appears to be a typographical error, this limitation will be read as "introducing air to the interior…".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 4, 6-11, 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taguchi et al. (US 2003/0003033) as in view of Posselt et al. (US 2003/0177760).

Regarding claims 4, 6 and 7, Taguchi discloses a method of operating a hydrogen generating apparatus (see abstract) comprising:

a hydrogen generator (Fig. 2) including a reformer (11) configured to generate a reformed gas from a material and steam (see description of reforming reaction in paragraph 49);

a shift converter (20) configured to cause the reformed gas supplied from said reformer to be subjected to a shift reaction (paragraph 50); and

a selective oxidation device (purifying section, 30) configured to decrease a concentration of carbon monoxide in the reformed gas after the shift reaction to a predetermined concentration or less (paragraph 51); and

a temperature sensor (such as temperature sensors 23,24,33 and 34) configured to detect one of a temperature of said shift converter and a temperature of said selective oxidation device (see location of temperature sensors in Fig. 2).

Taguchi teaches a method and a preference for a fast startup (bringing the temperature of the shift converter and selective oxidation device to an activation temperature as quickly as possible) and recognizes a problem that occurs during startup of the shift converter and selective oxidation device is that water contained on the catalyst prohibits the catalyst from heating up quickly (see paragraph 12). However, Taguchi does not explicitly disclose decreasing water or steam in an interior of said hydrogen generator when an increasing rate of the temperature detected by said temperature sensor is less than a predetermined threshold.

Posselt also discloses a method in which a device (in this case a catalytic converter) is brought to activation temperature quickly and also recognizes the problem that water on the catalytic converter will slow that startup time (see Fig. 2 and paragraph 14 which discloses such a situation).

Posselt teaches that when water is contained on a catalytic converter, the rate at which the temperature will increase (see curve 2.2 in Fig. 2 which illustrates an example where water is present on the catalyst and the temperature rising rate is very low, almost zero, while the water is evaporating from the catalytic converter) during startup is much lower than an ideal/predetermined temperature increase (see curve 2.1 in Fig. 2 which is an ideal curve for a temperature rise when no water is present on the catalytic converter, see also paragraph 14 for an explanation of this). In other words, Posselt suggests a preference for removing water from a catalyst monolith that is being heated in order to reduce the time needed to bring the monolith up to a desired temperature.

As such, seeing that it was well known in the art that water on a catalyst monolith significantly increases the time needed to heat said catalyst monolith, it would have been obvious to one of ordinary skill in the art at the time of the invention to remove/decrease water from the shift converter or the selective oxidation device of Taguchi when it is recognized that the rate of temperature increase of the shift converter or selective oxidation device is lower than is expected, in order to speed the heatup of the shift converter or selective oxidation device (as suggested by Posselt).

Regarding claims 8 and 9, Taguchi, as modified above further discloses introducing air to the interior of said shift converter (via conduit 27) in order to heat the shift catalyst

and prevent condensation and facilitate vaporization of water that is contained on the shift catalyst (paragraphs 79 and 80), but does not explicitly disclose that this takes place in the selective oxidation device or when an increasing rate of the temperature of said shift converter that is detected by said temperature sensor is less than a predetermined threshold. However, as modified above, Taguchi suggest the favorability to remove water from the inside of the hydrogen generator when an increasing rate of the temperature of said shift converter that is detected by said temperature sensor is less than a predetermined threshold. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention supply air to the interior of the shift converter and the selective oxidation device in order to remove the water from the catalyst.

Regarding claims 10 and 11, Taguchi, as modified above, teaches utilizing a heater (25) in the shift converter in order to heat the shift catalyst and prevent condensation and facilitate vaporization of water that is contained on the shift catalyst (see paragraphs 74 and 75), but does not explicitly disclose that this takes place in the selective oxidation device when an increasing rate of the temperature of said shift converter that is detected by said temperature sensor is less than a predetermined threshold. However, as modified above, Taguchi suggest the favorability to remove water from the inside of the hydrogen generator when an increasing rate of the temperature of said shift converter that is detected by said temperature sensor is less than a predetermined threshold. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to heat the interior of the shift converter and the selective oxidation device in order to remove the water from the catalyst.

Regarding claims 26 and 27, Taguchi discloses a method of operating a hydrogen generating apparatus (see abstract) comprising:

a hydrogen generator (Fig. 2) including a reformer (11) configured to generate a reformed gas from a material and steam (see description of reforming reaction in paragraph 49);

a shift converter (20) configured to cause the reformed gas supplied from said reformer to be subjected to a shift reaction (paragraph 50); and

a selective oxidation device (purifying section, 30) configured to decrease a concentration of carbon monoxide in the reformed gas after the shift reaction to a predetermined concentration or less (paragraph 51); and

a temperature sensor (such as temperature sensors 23,24,33 and 34) configured to detect one of a temperature of said shift converter and a temperature of said selective oxidation device (see location of temperature sensors in Fig. 2).

Taguchi teaches a method and a preference for a fast startup (bringing the temperature of the shift converter and selective oxidation device to an activation temperature as quickly as possible) and recognizes a problem that occurs during startup of the shift converter and selective oxidation device is that water contained on the catalyst prohibits the catalyst from heating up quickly (see paragraph 12). In addition, Taguchi discloses that water on the catalyst can deteriorate the catalyst (see paragraph 76). However, Taguchi does not explicitly disclose stopping operation of the hydrogen generator when an increasing rate of the temperature detected by said temperature sensor

is less than a predetermined threshold, or decreasing water or steam in an interior of said hydrogen generator when the hydrogen generator is stopped.

Posselt also discloses a method in which a device (in this case a catalytic converter) is brought to activation temperature quickly and also recognizes the problem that water on the catalytic converter will slow that startup time (see Fig. 2 and paragraph 14 which discloses such a situation).

Posselt teaches that when water is contained on a catalytic converter, the rate at which the temperature will increase (see curve 2.2 in Fig. 2 which illustrates an example where water is present on the catalyst and the temperature rising rate is very low, almost zero, while the water is evaporating from the catalytic converter) during startup is much lower than an ideal/predetermined temperature increase (see curve 2.1 in Fig. 2 which is an ideal curve for a temperature rise when no water is present on the catalytic converter, see also paragraph 14 for an explanation of this). In other words, Posselt suggests a preference for removing water from a catalyst monolith that is being heated in order to reduce the time needed to bring the monolith up to a desired temperature.

As such, seeing that it was well known in the art that water on a shift catalyst deteriorates the catalyst activity (as disclosed by Taguchi), it would have been obvious to one of ordinary skill in the art at the time of the invention to stop the hydrogen generator when an increasing rate of the temperature detected by said temperature sensor is less than a predetermined threshold (which suggests the presence of water on the catalyst, as suggested by Posselt) in order to provide maintenance to the deteriorated catalyst or to

remove the water that is contained in the hydrogen generator and prevent further deterioration of the catalyst.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Taguchi et al. (US 2003/0003033) as in view of Posselt et al. (US 2003/0177760) as applied to claim 4 above, and further in view of Aoyama (US 2002/0006364).

Regarding claim 5, Taguchi, as modified above, discloses a reduction in the amount of water in the hydrogen generator when the increasing rate of the temperature of the shift converter or selective oxidation device is less than desired. In other words, Taguchi discloses reducing the amount of water in the system when a temperature rising rate is too low. However, Taguchi fails to explicitly disclose decreasing an amount of the water or the steam supplied to the interior of said hydrogen generator when the increasing rate of the temperature detected by said temperature sensor is less than the predetermined threshold.

Aoyama also discloses a method for quickly starting a selective oxidation device (see abstract).

Aoyama teaches water (400) and a fuel (500) supplied to a reformer (200), which is similar to the method used by Taguchi, and sending the reformate produced to a selective oxidation device (120, see Fig. 6). Aoyama goes on to recognize the effect that water contained on the selective oxidation device has on the startup time of the selective oxidation device (see paragraphs 33 and 34). Aoyama suggests reducing the amount of

moisture in the reformate in order to prevent water condensation on the catalyst and an increase in startup time (see paragraphs 33 and 34).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to stop/decrease the amount of water supplied to the hydrogen generator of modified Taguchi (as suggested by Aoyama) when the increasing rate of the temperature is less than expected in order to reduce any more water being deposited on the catalyst surface and therefore increasing the startup time.

6. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Taguchi et al. (US 2003/0003033) as in view of Valcic (US 2001/0009144).

Regarding claim 28, Taguchi discloses a method of operating a hydrogen generating apparatus (see abstract) comprising:

a hydrogen generator (Fig. 2) including a reformer (11) configured to generate a reformed gas from a material and steam (see description of reforming reaction in paragraph 49);

a shift converter (20) configured to cause the reformed gas supplied from said reformer to be subjected to a shift reaction (paragraph 50); and

a selective oxidation device (purifying section, 30) configured to decrease a concentration of carbon monoxide in the reformed gas after the shift reaction to a predetermined concentration or less (paragraph 51).

Taguchi teaches a reformer heater/burner (12), but Taguchi fails to disclose stopping the operation of the hydrogen generator when a combustion sensor detects a vanished flame in the reformer heater.

Valcic also discloses a burner (see abstract).

Valcic teaches the use of a flame detection device (51) in order to detect the presence of the flame and further discloses that if said flame is not detected or vanishes, operation of the burner is halted for safety purposes (paragraph 43).

As such, it would have been obvious to one of ordinary skill in the art at the time of the invention to add the flame detection device of Valcic, to the reformer burner of Taguchi in order to provide a safety measure for the burner, and in turn, it would have been obvious to one of ordinary skill in the art at the time of the invention to halt operations of the hydrogen generating apparatus because without a flame, there is no heat supplied to the reformer, and the apparatus cannot function because the reforming reaction is endothermic and requires heat to be supplied by the burner.

Allowable Subject Matter

7. Claims 16-20 allowed.

8. The following is an examiner's statement of reasons for allowance:

9. Claim 16 claims a method of operating a hydrogen generating apparatus which contains a reformer, a shift converter, a selective oxidation device and a reformer heater wherein the reformer heater contains a combustion sensor configured to detect a combustion state of the reformer heater. The prior art teaches such an apparatus, however, the prior art neither teaches

nor suggests decreasing water or steam in the hydrogen generating apparatus when the combustion sensor reaches a numeric value at which the flame vanishes in the reformer heater during a time from when the shift converter reaches a shift reaction temperature until a time when the selective oxidation device reaches a selective oxidation reaction temperature.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

10. Claim 29 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: Claim 29 claims that after a flame vanishes in the reformer burner, and the hydrogen generating apparatus comes to a halt, the water/steam content in the hydrogen generating apparatus is decreased. The prior art neither teaches nor suggests decreasing the water/steam in a hydrogen generating apparatus after operations are stopped due to a vanished flame.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW J. MERKLING whose telephone number is (571)272-9813. The examiner can normally be reached on M-F 8:30-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. J. M./
Examiner, Art Unit 1795

/Jennifer K. Michener/
Supervisory Patent Examiner, Art Unit 1795